UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/518,643	07/15/2005	Hironari Akashi	21900-00052-US1	2851

30678 7590 06/04/2009

CONNOLLY BOVE LODGE & HUTZ LLP
1875 EYE STREET, N.W.
SUITE 1100
WASHINGTON, DC 20006

EXAMINER	
COMLEY, ALEXANDER BRYANT	
ART UNIT	PAPER NUMBER
3746	
MAIL DATE	DELIVERY MODE
06/04/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/518,643	AKASHI ET AL.	
	Examiner	Art Unit	
	ALEXANDER B. COMLEY	3746	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 March 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11 and 13-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11 and 13-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Status of the Claims

1. Examiner acknowledges receipt of Applicant's amendments and arguments filed with the Office on March 5th, 2009 in response to Non-Final Office Action mailed on December 24th, 2008. Per Applicant's response, only Claims 1 & 16 have been amended. Consequently, Claims 1-11 and 13-17 still remain for prosecution in the instant application. The Examiner has carefully considered each of Applicant's amendments and/or arguments, and they shall be addressed below.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. **Claims 1-9, 13, and 16-17** are rejected under 35 U.S.C. 102(b) as being anticipated by United States Patent No. 4,569,639 to Hannibal et al. directed to an Oil Distribution System for a Compressor.

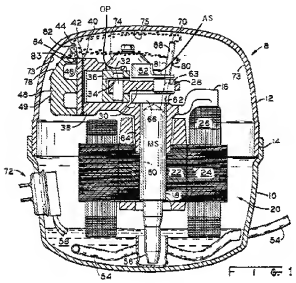


Fig. 1

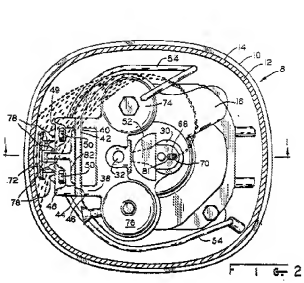


Fig. 2

(1) A hermetic compressor (8) having a sealed housing (10, 12) storing therein lubricating oil and receiving therein a motor element (20) and a compression element (36, 38) driven by said motor element, said compression element comprising a shaft (18) having an eccentric shaft portion (28), and an auxiliary shaft portion (AS) and a main shaft portion (MS) coaxially provided on upper and lower sides of said eccentric shaft portion so as to sandwich it therebetween, a cylinder block (38) provided with a compression chamber of a substantially cylindrical shape, a main bearing (64) fixed to or formed integral with said cylinder block so as to be substantially perpendicular to an axis of said compression chamber and supporting an upper half portion of said main shaft portion of said shaft, an auxiliary bearing (66) fixed to or formed integral with said cylinder block and supporting said auxiliary shaft portion, a piston (36) that performs reciprocating motion in said compression chamber, and connecting

means (30) for coupling said piston and said eccentric shaft together, wherein said shaft is provided with an oil feed mechanism (60) having a lower end (56) communicating with said lubricating oil and an upper end (68) penetratingly open to an upper end portion of said auxiliary shaft portion, and said auxiliary bearing is provided with an oil fence (82) for receiving the lubricating oil spouting out from the upper end portion of said oil feed mechanism and an oil feed passage (OP) for conducting the lubricating oil to a sliding surface of said piston, said oil fence including a vertical wall (See. Fig. 1) which intersects with an extension of the direction of radially scattering of the lubricating oil due to a centrifugal force from said oil feed mechanism, the shape of said oil fence and the position of said oil fence with respect to said oil feed mechanism being determined so that said radially scattering oil directly collide with said vertical wall (See Fig. 1), and then the oil is collected, said oil fence being located above said piston, said cylinder block having a shape so that most of an upper portion of said sliding surface of said piston is exposed to a space located above said cylinder when said piston is in the vicinity of a bottom dead center (Fig. 1) in such a manner that said space forms a part of said oil feed passage to lead the oil collected by said oil fence to the upper portion of said sliding surface of said piston.

(16) A hermetic compressor (8) having a sealed housing (10, 12) storing therein lubricating oil and receiving therein a motor element (20) and a compression element (36, 38) driven by said motor element, said compression element

comprising a shaft (18) having an eccentric shaft portion (28), and an auxiliary shaft portion (AS) and a main shaft portion (MS) coaxially provided on upper and lower sides of said eccentric shaft portion so as to sandwich it therebetween, a cylinder block (38) provided with a compression chamber of a substantially cylindrical shape, a main bearing (64) fixed to or formed integral with said cylinder block so as to be substantially perpendicular to an axis of said compression chamber and supporting an upper half portion of said main shaft portion of said shaft, an auxiliary bearing (66) fixed to or formed integral with said cylinder block and supporting said auxiliary shaft portion, a piston (36) that performs reciprocating motion in said compression chamber, and connecting means (30) for coupling said piston and said eccentric shaft together, wherein said shaft is provided with an oil feed mechanism (60) having a lower end (56) communicating with said lubricating oil and an upper end (68) penetratingly open to an upper end portion of said auxiliary shaft portion, and said cylinder block is provided with an oil fence (82) for receiving the lubricating oil spouting out from the upper end portion of said oil feed mechanism and an oil feed passage (OP) for conducting the lubricating oil to a sliding surface of said piston, said oil fence including a vertical wall (See Fig. 1) which intersects with an extension of the direction of radially scattering of the lubricating oil due to a centrifugal force from said oil feed mechanism, the shape of said oil fence and the position of said oil fence with respect to said oil feed mechanism being determined so that said radially scattering oil directly collide with said vertical wall (See Fig. 1), and then

the oil is collected, said oil fence being located above said piston, said cylinder block having a shape so that most of an upper portion of said sliding surface of said piston is exposed to a space located above said cylinder when said piston is in the vicinity of a bottom dead center (Fig. 1) in such a manner that said space forms a part of said oil feed passage to lead the oil collected by said oil fence to the upper portion of said sliding surface of said piston.

As shown best in Figure 1 above, Hannibal et al. discloses a hermetically-sealed, reciprocating compressor unit that utilizes a specially designed oil supplying and dispersing mechanism to sufficiently lubricate the vital moving parts of the compressor. To begin, Hannibal states "In a refrigeration compressor having at least one piston-cylinder arrangement therein for compressing gaseous refrigerant, an elongated, tube extending upwardly from a lubricant passage in the crankshaft for slinging oil radially, outwardly therefrom, and a lubricant deflector upstanding from the cylinder head to deflect slung oil over exterior surfaces of the cylinder head for conducting heat energy therefrom." (Abstract) Hannibal's system is unique in that it provides a vertically-disposed deflector member 82 (i.e. oil fence) disposed on the cylinder block/auxiliary bearing designed to catch radially-scattering oil from the oil slinger rod 68 and thereby provide vital lubrication to the parts disposed therebelow. To begin, Hannibal states "The present invention remedies the above problem of extremely high cylinder head temperatures by providing an oil deflector on the cylinder head, which is preferably cast of aluminum, to direct slung oil to the cylinder head side and end exterior surfaces to

conduct heat therefrom. To insure that a portion of the slung oil collects and flows downwardly over the end surfaces of the cylinder head the deflector is provided with at least one opening therein through which some of the slung oil may pass. Also provided with the present invention is an opening disposed through the side of an elongated, hollow body extending upwardly from the oil passage in the top of the crankshaft. The hole is disposed approximately level with the deflector on the cylinder head to provide a generally horizontal spray of oil thereto upon rotation of the crankshaft." (Col. 2, Lines 20-36) More specifically, Hannibal describes the basic structure of the compressor (i.e. housing, motor, piston, cylinder, etc) by stating "Referring to the drawings, and particularly FIG. 1, conventional compressor 8 comprises a lower housing 10 and upper housing 12, which may be welded or brazed at seam 14. Mounted within compressor 8 is crankcase 16 having crankshaft 18 rotatably received therethrough, and a motor 20 comprising rotor 22 secured to crankshaft 18 and stator 24 with field windings 26. The upper portion of crankshaft 18 has closed-loop end 28 of connecting rod 30 connected thereto and which has its opposite end connected by wrist pin 32 and spring clip 34 to piston 36 disposed in cylinder 38 of crankcase 16. Cylinder 38 has connected thereto gasket 40, leaf plate 42, valve plate 44, gasket 46, and cylinder head 48 by four bolts 50." (Col. 3, Lines 24-38) Hannibal goes on to disclose an oil feed mechanism, as well as main and auxiliary bearings by stating " Disposed in lower housing 10, along with refrigerant tubing 54, is oil pump 56 which is connected to the bottom end portion of crankshaft 18 in oil sump 58. Crankshaft 18 has axially disposed therein oil passage 60 and upper oil passage 62 for delivering oil to lubricate typical points, such as main

bearing 64 and thrust bearing 66." (Col. 3, Lines 41-47) It is important to note that the cylinder 38 and auxiliary bearing 66 are formed as an integral piece, and are therefore one and the same. Most importantly, however, is the structure of Hannibal's oil fence and cylinder structures. As the motor rotates the crankshaft, an oil slinger tube 68 disposed at the top of the crankshaft slings oil drawn up from the oil sump radially-outward toward the housing walls of the compressor (See Fig. 1). However, a portion of the radially-slung oil is caught by a vertically-disposed oil deflector member 82 disposed above the piston. To begin, Hannibal states "To insure that a portion of the oil slung from bleed hole 80 flows over end portion 49 of cylinder head 48 and ribs 78 disposed thereon, a deflector and heat sink flange member 82 having slots 84 disposed in the surface 83 thereof that faces tube 68 is vertically disposed on the top surface of cylinder head 48. Slots 84 extend through deflector 82. Consequently, upon slinger 68 rotating past cylinder head 48 a portion of oil is caught by deflector 82 and caused to flow over the surfaces of cylinder head 48 adjacent valve plate 44, while at the same time allowing a remaining portion of the oil to pass through slots 84 and to flow over end portion 49 of cylinder head 48 and ribs 78." (Col. 5, Lines 1-13) As can be seen in Figure 1, as the oil hits the deflector 82, it will be forced by gravity to flow downward over the top surface of the cylinder 38 into passage OP disposed in the sidewall of the cylinder 38. The piston 36 can be seen in bottom dead center position in Figure 1, and due to the structure of the passage OP and rear extent of the piston, most of an upper portion of the sliding surface of the piston is exposed to a space located above the cylinder. Therefore, it's clear that the opening OP and space above the piston function

to lead the oil collected by the oil fence 82 directly to the sliding surface of the piston.

4. In regards to dependent **Claims 2, 5-6, & 8**, it can be seen in Figure 1 that the upper surface of the cylinder 38 contains multiple concavities that serve as oil pools/guides/openings for the oil to flow therethrough on its path toward the piston oil supply passage OP (i.e. cylinder communicating hole). Hence, each of these concavities communicate with the oil slinger rod 68 and the piston oil supply passage OP. Regarding dependent **Claims 3-4, 13, & 17**, Hannibal discloses a horizontally-disposed oil dispersion hole 80 communicating with the oil feed passage 60 by stating "To reduce the temperature of cylinder head 48, bleed holes 80 and 81 are disposed in the side of oil slinger tube 68, with bleed hole 80 facing radially outwardly therefrom. Because slinger 68 rotates with crankshaft 18, bleed hole 80 will always rotate facing towards upper housing 12. This permits a portion of the oil traveling upwardly through slinger 68 to be slung generally horizontally, radially outwardly through bleed hole 80. As slinger 68 rotates past cylinder head 48, a spray of oil is slung from bleed hole 80 onto cylinder head for cooling purposes." (Col. 4, Lines 55-65) Moreover, it can be seen in Figure 1 that the horizontally-slung oil collides with the upwardly-projecting oil fence member 82 disposed on the upper surface of the cylinder/auxiliary bearing (38, 66) in order to flow downwardly to a piston oil supply passage OP (i.e. oil feed passage) disposed in the cylinder block 38 above the compression chamber. In regards to dependent **Claims 7 & 9**, a wrist pin 32 (i.e. piston pin) can be seen within an annular piston groove and located directly below the opening portion and oil passage OP at

bottom dead center (See Fig. 1), wherein the opening portion is of a larger horizontal cross-section than the pin 32.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. **Claims 10-11** are rejected under 35 U.S.C. 103(a) as being unpatentable over United States Patent No. 4,569,639 to Hannibal et al. in view of United States Patent No. 4,576,555 to Ashenfelter directed to an Oil Dispersing Device.

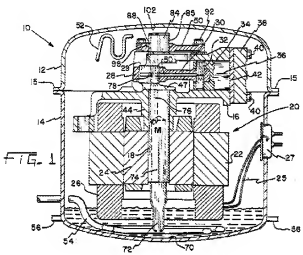


FIG. 1

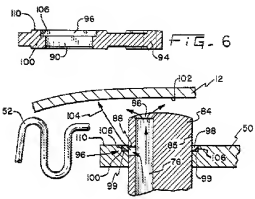


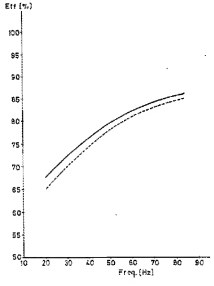
FIG. 6

FIG. 3

Regarding dependent **Claims 10-11,** Hannibal fails to specifically disclose an oil bath structure formed around the auxiliary shaft portion or an oil feed hole providing communication between said oil bath and the oil feed mechanism. However, as can be seen best in Figures 3 and 6 above, Ashenfelter discloses an auxiliary bearing 50 that contains an annular counterbore 96 (i.e. oil pool or oil bath) with an upwardly projecting oil fence 106 provided on an upper surface of the bearing itself. Moreover, the oil pool 96 and oil fence 106 align with a horizontally disposed oil dispersion hole 88. In particular, Ashenfelter states "In operation, as illustrated in FIG. 3, oil will travel upwardly through oil passage 76 in upper portion 84 of crankshaft 18. A portion of the oil will be slung outwardly through radial oil passage 88 into annulus 98. Oil will collect in corner 100 of annulus 98 and will pool therein as indicated by shaded portion 99. Additional oil passing outward of passage 88 will be deflected upwardly from the surface of oil trapped in corner 100 and will then pass upwardly over shock loop 52 directly onto wall 102 of upper housing 12 as indicated by arrow 104." (Column 6, Line 61 - Column 7, Line 3) Therefore, to one of ordinary skill desiring more efficiently lubricated

bearings, it would have been obvious to utilize the techniques disclosed in Hannibal et al. in combination with those seen in Ashenfelter in order to obtain such a result. Consequently, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the auxiliary bearing 66 of Hannibal with the oil bath/feed hole of Ashenfelter in order to obtain predictable results; those results being a longer-lasting auxiliary bearing that is sufficiently lubricated.

F I G.13



8. **Claims 14 & 15** are rejected under 35 U.S.C. 103(a) as being unpatentable over the United States Patent No. 4,569,639 to Hannibal et al. in view of United States Patent to Hayashi (5,506,486) directed to a Control Apparatus for Compressor with Induction Motor. In regards to dependent **Claims 14-15**, Hannibal fails to specifically disclose an that the motor is inverter-driven or Applicant's claimed operating frequencies. However, with reference to Figure 13 shown immediately above, the Hayashi portion of the combination specifically shows the use of a plurality of operating frequencies for a hermetic compressor driven by an induction motor. In particular,

Figure 13 contains a solid line depicting the relationship between a range of operating frequencies and corresponding operating efficiency of the compressor, which clearly includes at least an operating frequency of less than the power source frequency and at least an operating frequency of less than 30 Hz. Therefore, to one of ordinary skill in the art desiring a compressor that reduces the overall power consumption of the motor, it would have been obvious to utilize the control techniques disclosed in Hayashi in combination with the compressor motor of Hannibal in order to obtain this result. Consequently, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the compressor of Hannibal et al. with the inverter of Hayashi in order to reduce electric power consumption.

Response to Arguments

9. Applicant's arguments with respect to claims 1-11 and 13-17 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ALEXANDER B. COMLEY whose telephone number is (571)270-3772. The examiner can normally be reached on M-F 7:30am - 5:00am EST (Alternate Fridays Off). If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Devon C. Kramer can be reached on (571)-272-7118. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Alexander B Comley/
Examiner, Art Unit 3746

/Devon C Kramer/
Supervisory Patent Examiner, Art Unit 3746

ABC